ENTRY FORM

DVASE
2019 Excellence in Structural Engineering Awards Program

PROJECT CATEGORY (check one):

Buildings under $5M		Buildings Over $100M	
Buildings $5M-$15M	X	Other Structures Under $1M	
Buildings $15M - $40M		Other Structures Over $1M	
Buildings $40M - $100M		Single Family Home	

Approximate construction cost of facility submitted:	$12M
Entry Fee:	**FREE**
Name of Project:	Fellowship Village Senior Living Theater Addition
Location of Project:	Basking Ridge, NJ
Date construction was completed (M/Y):	Under Construction, Projected Completion – Spring 2019
Structural Design Firm:	Michael A. Beach & Associates
Affiliation:	**All entries must be submitted by DVASE member firms or members.**
Architect:	KDA Architects
General Contractor:	Lecesse Construction

Company Logo (insert .jpg in box below)

Michael A. Beach & Associates
Consulting Structural Engineering

Provide a concise project description in the following box (one page maximum). Include the significant aspects of the project and their relationship to the judging criteria.

Fellowship Senior Living is located in Basking Ridge, NJ and is home to more than 450 residents. Over the past several years there has been increasing demand for additional programs at the facility. Their existing 80 seat multipurpose room was inadequate both in capacity and technology to meet the needs of a growing community. The next generation for Continuing Care and Retirement Communities wants facilities with walking distance to state-of-the-art fitness centers, restaurants, shops, salons, theaters, performing arts and cultural programs, wellness and personal training programs, and other amenities that enhance their health, independence and help them to stay connected to the greater community. Facility management at Fellowship Village took the first step to meet the demand of the community to develop a new auditorium addition in the heart of the community center at the facility. Fellowship Village collaborated with two regional performing arts organizations that were looking for a home venue for their presentations. Collaborating with these organizations, a team of theater design specialists and the architectural team designed a new state of the art auditorium to provide the setting for the presentation of high quality and diverse programming for the community. Designed for flexibility, the auditorium has 140 retractable seats with the capacity for an additional 100 floor seats to accommodate large productions and events. The retractable seating allows for an entirely open floor for banquet seating.

The new theater planning required a full production stage and sound system experience. The key to the success of the theater being able to put on a full Broadway experience was to maximize the stage size and the fly tower in the small available footprint. The fly system is a rigging system using rope lines, pulleys, and counterweights that enables a stage crew to hoist quickly, quietly and safely components such as curtains, lights, scenery, stage effects and, sometimes people. To incorporate this system of rigging required a very tall fly loft is located 43 feet above the stage. In addition, a loading gallery is positioned above the stage and is utilized to hold the counterweights for the fly system. The loading gallery required a significant 400 psf design dead load. The proscenium opening to the stage is 50 feet wide.

Steel framing was selected for the structure of the new theater addition and a combination of braced frames and moment frames were designed for the lateral force resisting system. The first floor of the theater seating area, stage, and orchestra pit is comprised of steel beams and a concrete slab on metal deck. The roof areas surrounding the main seating area of the addition are comprised of steel beams supporting pre-engineered wood roof trusses. The roof over the fly tower is framed with steel beams supporting metal roof deck. The roof over the main theater seating area is comprised of heavy timber trusses with a tongue and groove wood plank roof deck.

Complications for the project started early due to the proximity of the addition to existing buildings. The structures surrounding the addition are comprised of a single story community building and a two story wood framed apartment buildings. The community building has a partial basement and the adjacent apartment building did not have a basement. Since the new theater building contained a basement the layout of the new basement needed to be modified to minimize the amount of underpinning that would be required at the existing apartment building. The foundations for the new building are comprised of a conventional reinforced concrete spread footing system. However, the local geology in the area is predominately rock and excavating the basement into the existing rock subsurface required specialized excavation equipment. The tall braced frames utilized for the lateral force resisting system of the fly tower were slender due to the need to maximize the stage and proscenium opening. The tall and narrow braced frames resulted in large uplift forces in the columns. The columns also support relatively small dead loads resulting in large net uplift forces. In order to minimize rock excavation to construct large foundations with sufficient mass to resist the uplift reactions, rock anchors were utilized at some of the braced frame column footings to provide the required uplift resistance.

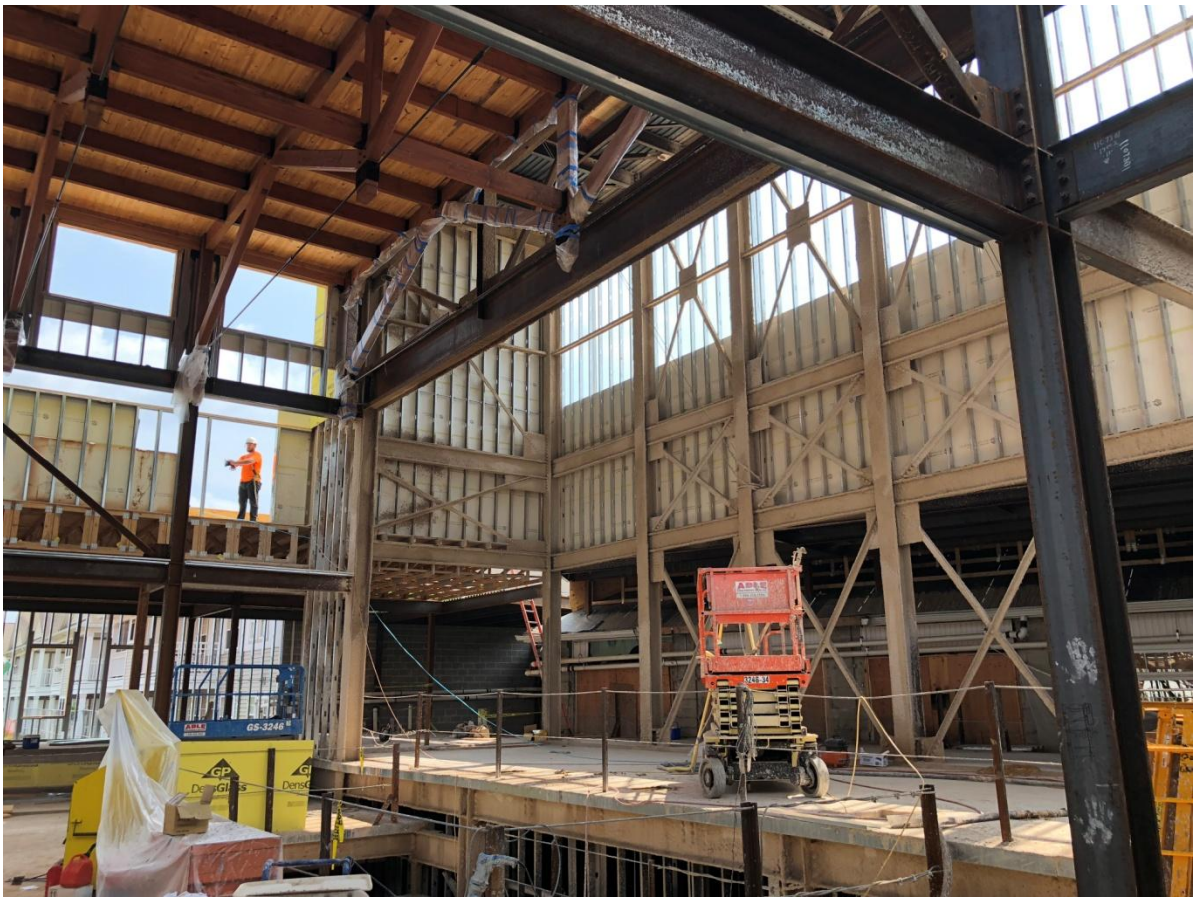
Other complications in the design of the structure included a discontinuous lateral force resisting braced frame, large roof diaphragm openings in the fly tower roof for smoke vents, and the development of a system to drag the lateral force from the roof diaphragm of the heavy timber truss roof to the lateral force resisting system.

The discontinuous braced frame at the rear of the theater seating space required the design of a horizontal steel truss in the first floor slab over the basement to drag the braced frame load into a reinforced concrete basement shear wall. The large roof openings in the fly tower roof made the use of a metal deck roof diaphragm unviable. Once again, horizontal steel bracing was designed below the roof framing to replace the diaphragm and transfer the loads to the vertical braced frames around the fly tower.

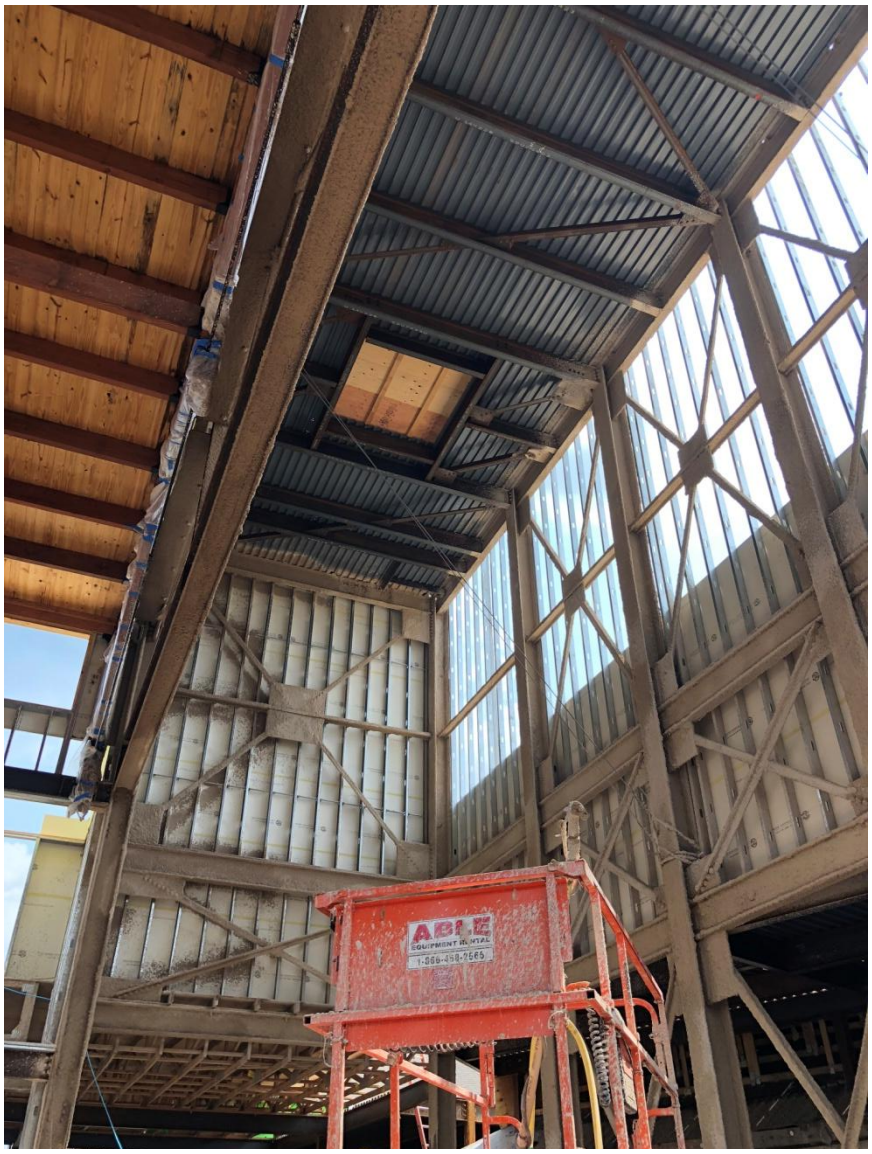
The last obstacle to the structural design that needed to be overcome was how to drag the roof diaphragm load from the top of the heavy timber trusses to the steel moment frames that support the trusses. The trusses span across the seating area floor and are 50 feet long and 8 feet deep. In addition, the architectural program sought to maximize the amount of natural light into the theater space by designing windows around the high roof area between the top of steel frame and high roof diaphragm. The original design was for a “ribbon” window at this location. However, providing roll over bracing of the trusses and the discontinuous roof diaphragm load path was a concern. Therefore, a compromise was made with the architect to provide wall pier segments between the windows located at each truss bearing that served as shear walls to brace the ends of the trusses and drag the diaphragm load from the top of the wood trusses to the moment frames. The shear wall segments were made with metal studs and metal strapping with conventional Simpson hold-downs at the ends of the wall segments.

The end result of the project is a high end theater experience for the community and a new space for two local theater companies to call home.

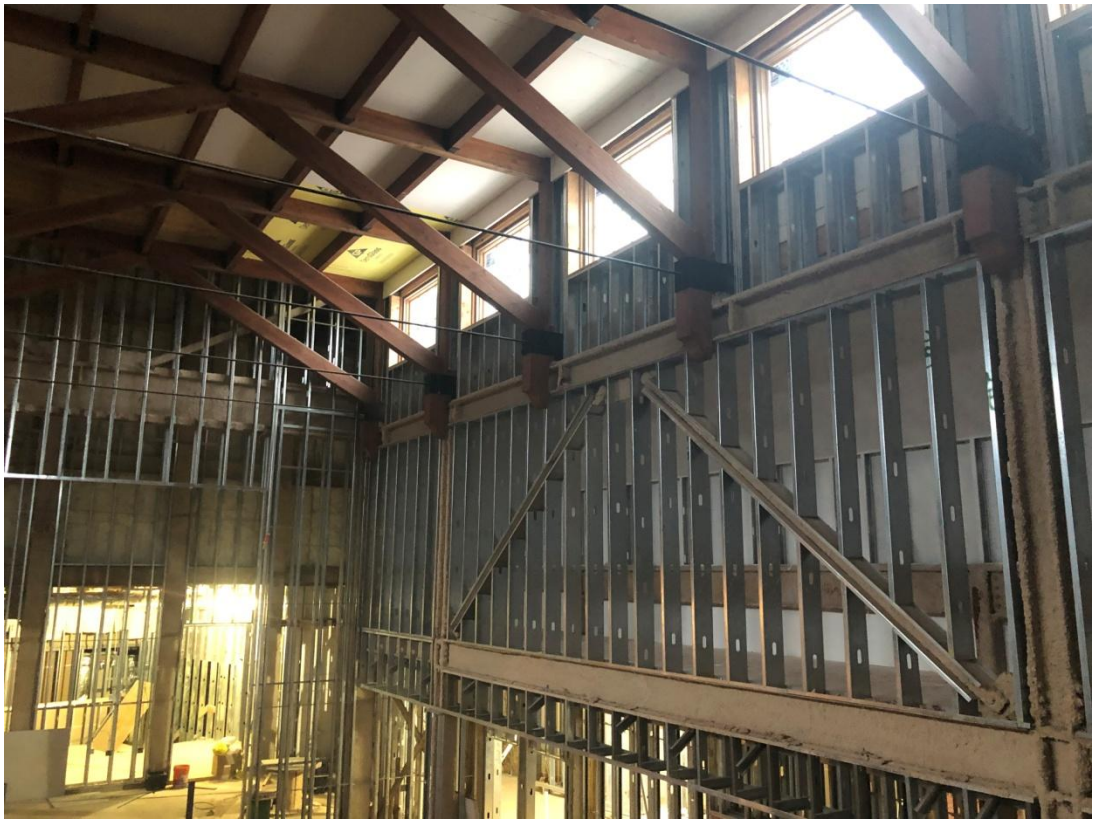
Heavy timber roof trusses with braced frames at fly tower and W27x94 over proscenium opening.



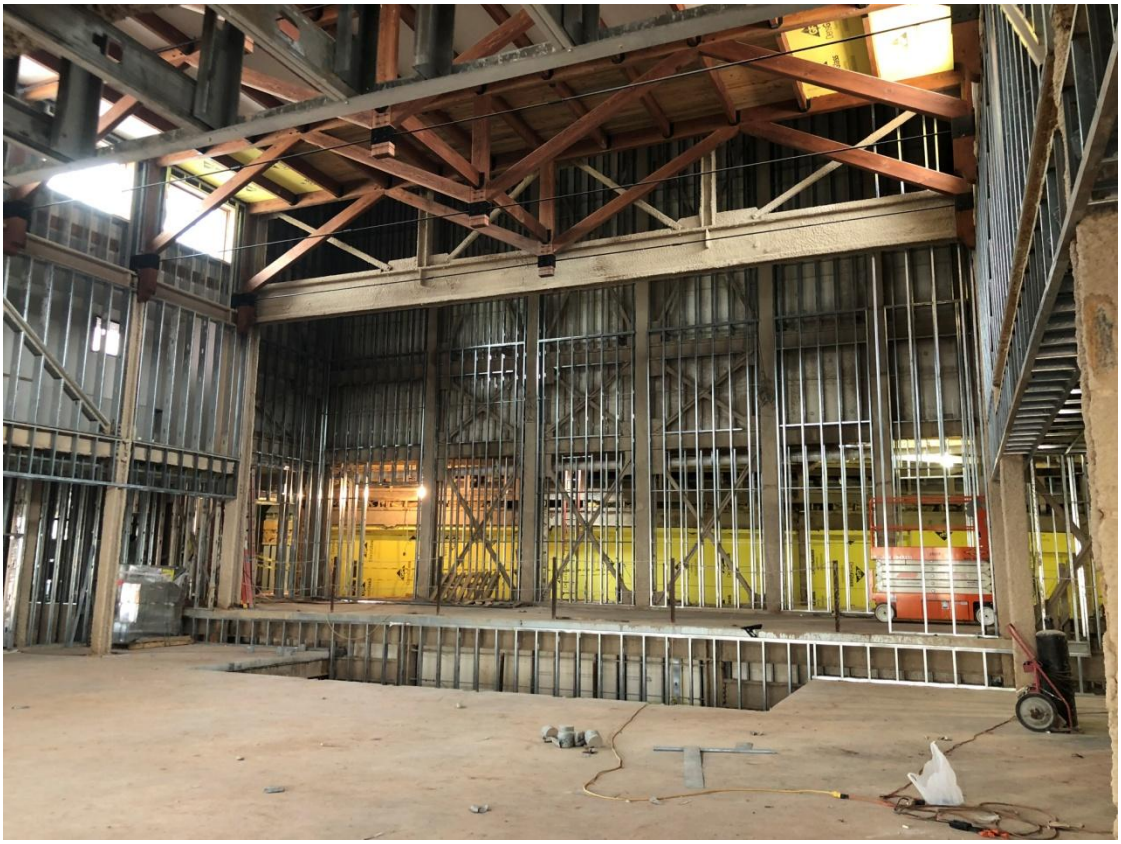
Stage, orchestra pit, fly tower and proscenium construction.



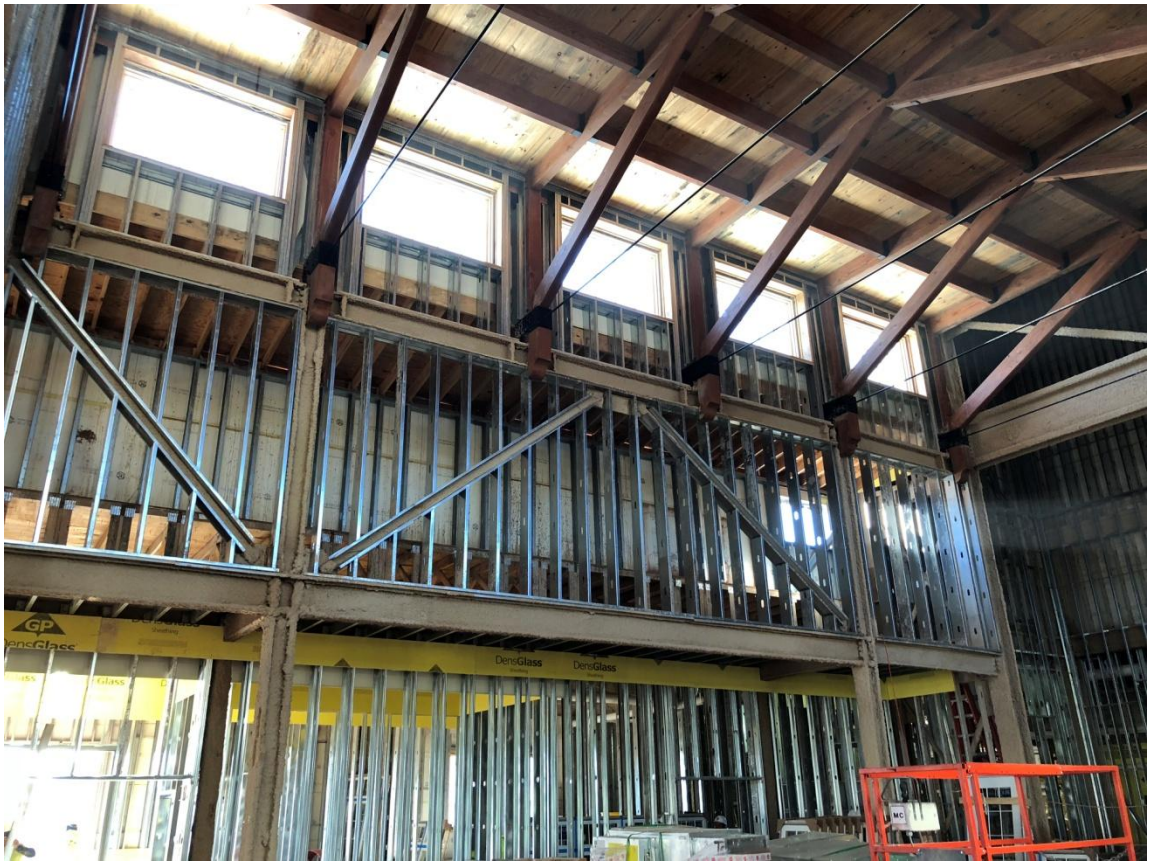
Fly tower construction.



Heavy timber truss bearing with shear wall segments at each truss bearing for roof diaphragm transfer.



Proscenium opening with orchestra pit in front of stage.



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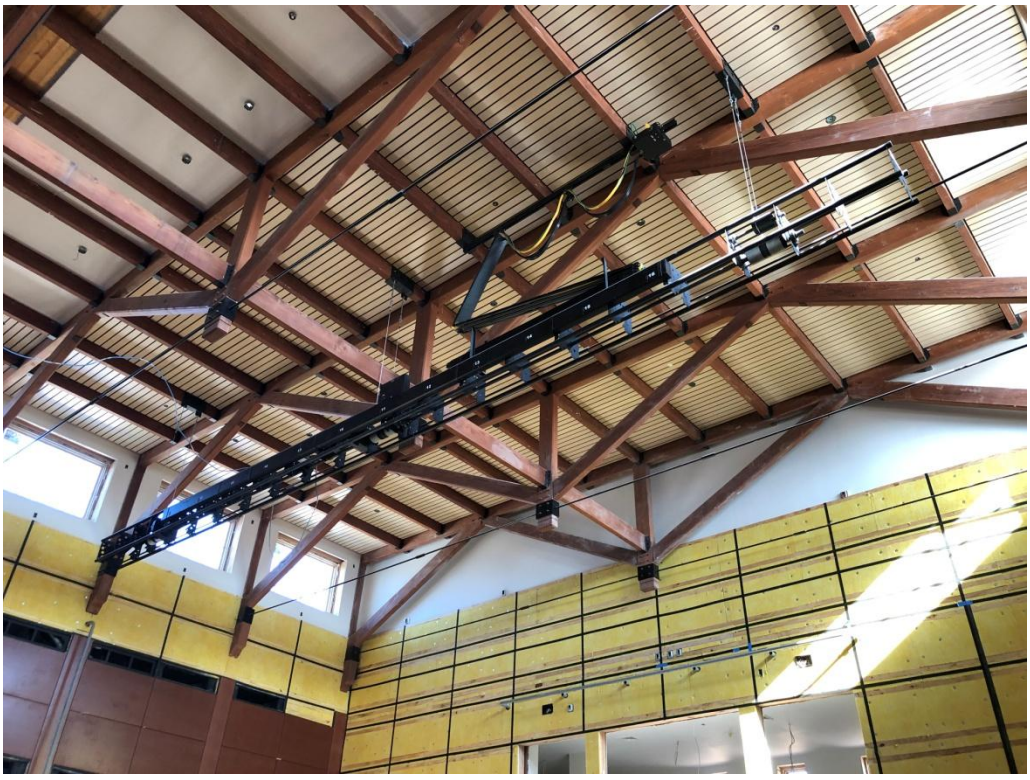
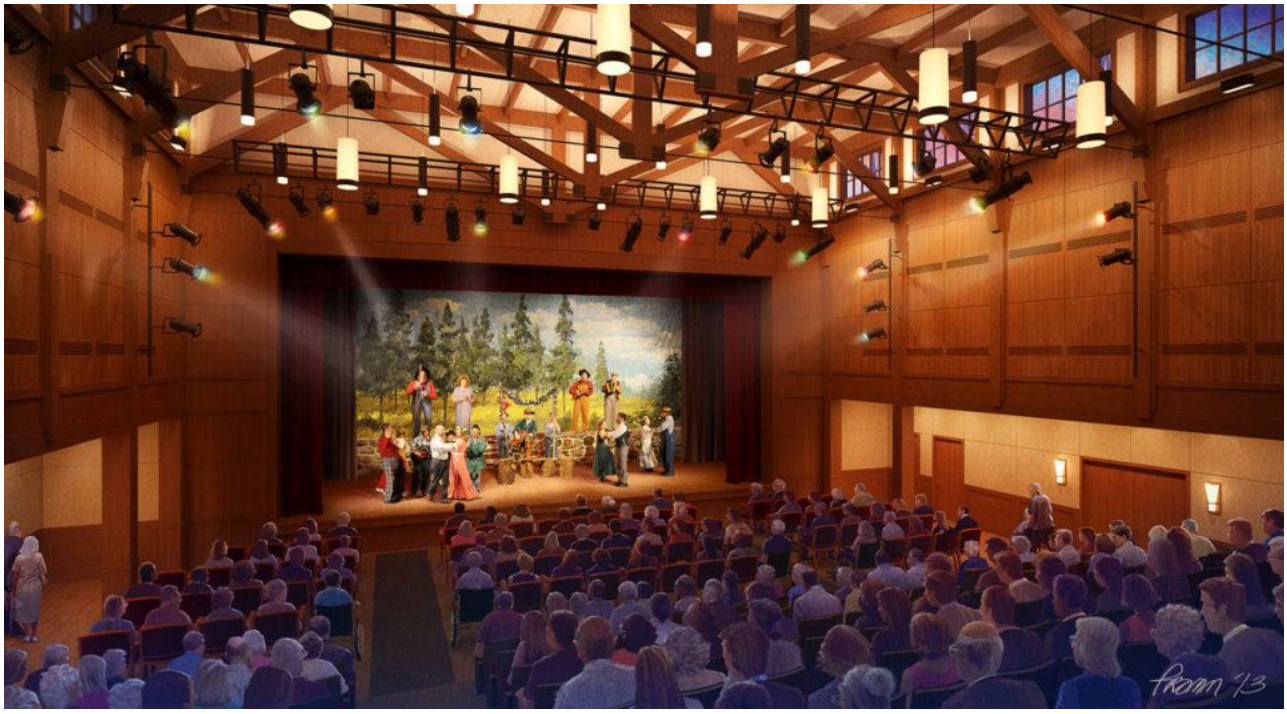


Heavy timber trusses with theatrical lighting.

Theater addition location between existing buildings.



Rendering of project with production.

By signing, signatory agrees to the following and represents that he or she is authorized to sign for the structural design firm of record:

All entries become the property of DVASE and will not be returned. By entering, the entrant grants a royalty-free license to DVASE to use any copyrighted material submitted.

If selected as an award winner, you may be offered the opportunity to present your project at a DVASE breakfast seminar. Would you be willing to present to your colleagues? Yes

Submitted by:

Print name:	**Signature:**	**Date:**
Paul Constantini		**03/29/19**

Submitting Firm:	**Michael A. Beach & Associates**	
Mailing address:	**200 Birchfield Drive Suite 205 Mount Laurel, NJ 08054**	
Telephone: **856-273-1909**	**Fax:** **856-273-1480**	**Email:** **paulc@mabeachassoc.com**